

# PAUL JOSEPH STEINHARDT

## ADDRESS

Department of Physics  
Jadwin Hall  
Princeton University  
Princeton, NJ 08544-0708

## PROFESSIONAL HISTORY

### **Princeton University**

Albert Einstein Professor in Science, 2001-  
Professor of Physics, 1998-2001  
Associated Faculty, Department of Astrophysical Sciences, 1998-

Director, Princeton Center for Theoretical Physics 2008-  
(Associate Director and Senior Fellow, 2006-7)

### **University of Pennsylvania, Department of Physics**

Mary Amanda Wood Chair Professor, 1989-1998  
Professor of Physics, 1986-89  
Associate Professor of Physics, 1983-86  
Assistant Professor of Physics, 1981-83

### **Harvard University, Society of Fellows**

Junior Fellow, 1978-81

## EDUCATION:

1978 - Ph. D., Physics, Harvard University  
1975 - M. A., Physics, Harvard University  
1974 - B. S., Physics, California Institute of Technology

OTHER PROFESSIONAL POSITIONS

Keck Distinguished Visiting Professor, Institute for Advanced Study, Princeton; 2003-4  
 Editor, Physics Series, Princeton University Press, 1999 -  
 Visiting Faculty (Dyson Fellowship), Institute for Advanced Study, Princeton; January,  
 May 1995  
 Visiting Faculty, Institute for Theoretical Physics, Santa Barbara CA; February-April,  
 1995  
 Consultant, IBM Research Laboratories, Yorktown Heights, NY; 1978-91  
 Visiting Faculty (Monell Fellowship), Institute for Advanced Study, Princeton; Septem-  
 ber, 1989 - March, 1990  
 Visiting Faculty, Institute for Advanced Study, Princeton; January-March, 1985  
 Visiting Faculty, T. J. Watson Research Laboratory, Yorktown Heights, NY; August-  
 December, 1984  
 Visiting Professor, Department of Physics, Johns Hopkins University; Spring, 1983  
 Visiting Scientist, Theory Group, Stanford Linear Accelerator Center; July, 1980  
 Visiting Scientist, Department of Physics, Tel-Aviv University, Tel-Aviv, Israel; Decem-  
 ber, 1979-January, 1980  
 Visiting Scientist, C.E.R.N. Laboratory, Theory Group, Geneva, Switzerland; August,  
 1979  
 Visiting Scientist, Department of Physics, Princeton University, January-May, 1979

PROFESSIONAL ORGANIZATIONS

Fellow, American Physical Society  
 Sigma Xi  
 American Astronomical Society  
 National Academy of Sciences

HONORS AND FELLOWSHIPS

Seyfert Lecturer, Vanderbilt University, 2011  
 Oliver Buckley Prize, American Physical Society, 2010, "*For pioneering contributions to  
 the theory of quasicrystals, including the prediction of their diffraction pattern.*"  
 Elon Musk Public Lecture, University of Pennsylvania, December, 2009  
 Vivian J. Lamb Lecturer, Augustinian Institute, Villanova University, April, 2009  
 Honorable Mention, Gravitational Research Foundation, for Essay entitled "Return of  
 the Phoenix Universe" (w/J.-L. Lehnert and N. Turok); 2009  
 Plenary Lecturer, 50th Anniversary Meeting of the British Applied Mathematics Con-  
 ference (BAMC), 2008  
 Fred Elston Memorial Lecturer, ERAU, 2008  
 Hans Jensen Lecturer, Heidelberg University, 2007  
 Einstein Colloquium, Weizmann Institute, 2006

Distinguished Lecture Series, Technion, 2006  
Simons Foundation Distinguished Lecturer, SUNY at Stony Brook, October, 2004  
McMaster Colloquium in Cosmology, U. of Toledo, October, 2004  
Keck Distinguished Visiting Professor, Institute for Advanced Study, 2003  
P.A.M. Dirac Medal of the International Centre for Physics, 2002, "*For the development of the concept of inflation in cosmology.*" Joseph and Sophia Konopinski Memorial Lecture in Physics, Indiana University, February, 2002  
Colloquium Ehrenfestii, Leiden University, September 6, 2001  
PASCOS Public Lecture, April, 2001  
Boris Jacobson Lecturer, U. of Washington, May, 2000  
Member, National Academy of Sciences, 1998-  
Inaugural C.I.T.A. Lecturer, (Canadian Institute for Theoretical Astrophysics), June, 1996  
1996 Welsh Distinguished Lecturer, University of Toronto, May, 1996  
 $\Sigma\Pi\Sigma$  Distinguished Lecturer, Villanova University, April, 1996  
John Simon Guggenheim Fellowship, 1994-5  
Freeman Dyson Fellowship, Institute for Advanced Study, 1995  
First Award, Gravitational Research Foundation, for Essay entitled "Gravity's Rainbow," (with G. F. Smoot); 1993  
Rose Award for Faculty Supervisor of Most Outstanding Senior Thesis (advisee Rennan Barkana), University of Pennsylvania, 1993  
Loeb Lecturer, Harvard University; March, 1991  
Second Award, Gravitational Research Foundation, for Essay entitled "New Approaches to Inflationary Cosmology," (with F. S. Accetta); 1990  
Monell Foundation Fellowship, Institute for Advanced Study, Princeton, NJ; 1989-90  
Frontiers of Science Lecture, University of Utah, April, 1990  
Phi Beta Kappa National Visiting Lecturer, 1989-90  
Alfred P. Sloan Foundation Fellowship, 1982-86  
William Pyle Phillips Lecturer, Haverford College, 1982  
Junior Investigator Grant, Department of Energy, 1982-83

## PUBLICATIONS

## JOURNAL PUBLICATIONS

1. “Effects of Random Link Removal on the Photonic Band Gaps of Honeycomb Networks,” (with M. Florescu and S. Torquato), submitted to *Applied Physics Letters* (2010).
2. “Once upon a time in Kamchatka: The Search for Natural Quasicrystals,” (with L. Bindi) to appear in *Phil. Mag.* (2010).
3. “Experimental observation of photonic bandgaps in hyperuniform disordered material,” (with W. Man, M. Florescu, K. Matsuyama, P. Yadak, S. Torquato, and P. Chaikin), in Conference on Lasers and Electro-Optics (CLEO) and the Quantum Electronics and Laser Science Conference (QELS) (Optical Society of America, Washington, DC, 2010), paper CThS2. ISBN: 978-1-55752-889-6
4. “Exploring extra dimensions through observational tests of dark energy and varying Newton’s constant,” (with D. Wesley), arXiv:1003.2815 (astro-ph) (2010).
5. “Measurement of  $S(q)$  as  $q \rightarrow 0$  in amorphous Si,” (with R. Xie, G. G. Long, S. J. Weigand, S. C. Moss, S. Roorda, M. F. Thorpe, A.M.R. de Graff, and Salvatore Torquato), 11th International Conference on the Structure of Non-Crystalline Materials, to appear (2010).
6. “Order and disorder in freestanding pure amorphous Si and amorphous Si over Si(001),” (with G. G. Long, R. Xie, S. J. Weigand, S. C. Moss, S. Roorda, M. F. Thorpe, A.M.R. de Graff, and Salvatore Torquato), 11th International Conference on the Structure of Non-Crystalline Materials, to appear (2010).
7. “Adiabatic Ekpyrosis: Scale-Invariant Curvature Perturbations from a Single Scalar Field in a Contracting Universe,” (with J. Khoury), *Phys. Rev. Lett.* **104**, 091301 (2010).
8. “Return of the Phoenix Universe,” (with J.-L. Lehners and N. Turok), *Int. J. Mod. Phys. D***18**, 2231-35 (2009).
9. “Non-Gaussianity Generated by the Entropic Mechanism in Bouncing Cosmologies Made Simple,” (with J.-L. Lehners), *Phys. Rev. D***80**, 103510 (2009).
10. “Cosmological Problems with Multiple Axion-like Fields,” (with K. J. Mack), arXiv:0911.0413 (astro-ph) (2010).
11. “Complete Band Gaps in 2d Photonic Quasicrystals,” (with M. Florescu and S. Torquato), *Phys. Rev. B* **80** 155112 (2009).
12. “Natural Quasicrystals,” (with L. Bindi, N. Yao and P. Lu), *Science* **324**, 1306-9 (2009).

13. “Designer disordered materials with large complete photonic band gaps,” (with M. Florescu and S. Torquato), *PNAS* **106** 20658-63 (2009).
14. “Dark Energy and the Return of the Phoenix Universe,” (with J.-L. Lehners), *Phys. Rev. D***79**, 063503 (2009).
15. “Dark Energy, Inflation and Extra Dimensions,” (with D. Wesley), *Phys. Rev. D***79**, 104026 (2009).
16. “Proving Inflation: A Bootstrap Approach,” (with L. Boyle), arxiv:0810.2787 (astro-ph) (2009).
17. “Evolution to a smooth universe in an ekpyrotic contracting phase with  $w > 1$ ,” (with D. Garfinkle, W.-C. Lim, and F. Pretorius), *Phys. Rev. D.*, 083537 (2008).
18. “Intuitive understanding of non-gaussianity in ekpyrotic and cyclic models,” (with J.-L. Lehners), *Phys. Rev. D***78**, 023506 (2008); erratum *D***79**, 122902 (2009).
19. “Optimized Structures for Photonic Quasicrystals,” (with M.C. Rechtsman, H.-C. Jeong, P.M. Chaikin, and S. Torquato), *Phys. Rev. Lett.* **101**, 073902 (2008).
20. “How does your quasicrystal grow?”, *Nature*, **452** 43-44 (2008).
21. “Probing the early universe with inflationary gravitational waves,” (with L. Boyle), *Phys. Rev. D***7**, 063504 (2008).
22. “Non-Gaussian Density Fluctuations from Entropically Generated Curvature Perturbations in Ekpyrotic Models,” (with J.-L. Lehners), *Phys.Rev.D***77**, 063533 (2008).
23. “A Delicate Universe,” (with D. Baumann, A. Dymarsky, I. Klebanov, and L. McAllister) *Phys. Rev. Lett.* **99**, 141601 (2007).
24. “Gravitational Wave Spectrum from Primordial Scalar Perturbations,” (with D. Baumann, K. Takahashi, and K. Ichiki), *Phys. Rev. D***76**, 084019 (2007).
25. “Generating Ekpyrotic Curvature Perturbations Before the Big Bang,” (with J.-L. Lehners, P. McFadden and N. Turok), *Phys. Rev. D***76**, 103501 (2007).
26. “Constraints on the Interactions between Dark Matter and Baryons from the X-ray Quantum Calorimetry Experiment,” (with A. L. Erickcek, D. McCammon and P. C. McGuire), *Phys. Rev. D***76** 042007 (2007).
27. “Primordial Black Hole Baryogenesis,” (with D. Baumann and N. Turok), hep-th/0703250.
28. “Decagonal and nearly-perfect Quasicrystalline Penrose Tilings in Medieval Islamic Architecture,” (with P. Lu), *Science* **315**, 1106 (2007).

29. “Cosmic perturbations through the ages,” (with J.K. Erickson, S. Gratton and N. Turok), *Phys. Rev. D* **75**, 123507 (2007).
30. “Why the cosmological constant is small and positive,” (with N. Turok), *Science* **312**, 1180-1182, (2006).
31. “Solution of a Braneworld Big Crunch/Big Bang Cosmology,” (with P. McFadden and N. Turok), *Phys. Rev. D* **76**, 104038 (2007).
32. “Inflationary predictions for scalar and tensor fluctuations reconsidered,” (with L. Boyle and N. Turok), *Phys. Rev. Lett.* **96**, 111301 (2006).
33. “Experimental Measurement of the Photonic Properties of Icosahedral Quasicrystals,” (with W. Man, M. Megens, and P. Chaikin), *Nature* **496**, 993-996 (2005).
34. “Controlling Chaos through Compactification in Cosmological Models with a Collapsing Phase,” (with D.H. Wesley and N. Turok), *Phys. Rev. D* **72**, 063513 (2005).
35. “Dynamical dark energy: Current constraints and forecasts,” (with A. Upadhye and M. Ishak), *Phys. Rev. D* **72**, 063501 (2005).
36. “M-theory Model of a Big Crunch/Big Bang Transition,” (with N. Turok and M. Perry), *Phys.Rev. D* **70** 106004 (2004).
37. “The Cyclic Model Simplified,” (with N. Turok) *New Astronomy Reviews* **49**, 43-7 (2005).
38. “Gravitational baryogenesis,” (with H. Davoudiasl, R. Kitano, G.D. Kribs, and H. Murayama), *Phys. Rev. Lett.* **93**, 201301 (2004).
39. “A new duality relating density perturbations in expanding and contracting Friedmann cosmologies,” (with L.A. Boyle and N. Turok) *Phys. Rev. D* **70** 023504 (2004).
40. “Kasner and mixmaster behavior in universes with equation of state  $w|ge1$ ,” (with J. Erickson, D. Wesley, and N. Turok), *Phys. Rev. D* **69**, 063514 (2004).
41. “The Cosmic Gravitational-Wave Background in a Cyclic Universe,” (with L. Boyle and N. Turok), *Phys. Rev. D* **69**, 127302 (2004).
42. “Designing Cyclic Universe Models,” (with J. Khoury and N. Turok), *Phys. Rev. Lett.* **92**, 031302 (2004).
43. “Cosmological Perturbations in a Big Crunch/Big Bang Spacetime,” (with A. Tolley and N. Turok), *Phys. Rev. D* **69r**, 106005 (2004).
44. “Inflation versus Cyclic Predictions for Spectral Tilt,” (with J. Khoury and N. Turok), *Phys. Rev. Lett.* **91**, 161301 (2003).

45. “Conditions for Generating Scale-Invariant Density Perturbations,” (with S. Gratton, J. Khoury, and N. Turok), *Phys. Rev. D***69** 103505 (2004).
46. “Precision Cosmology? Not Just Yet...” (with S.L. Bridle, O. Lahav, J.P. Ostriker), *Science* **299**, 1532-3 (2003).
47. “Effects of the Sound Speed of Quintessence on the Microwave Background and Large Scale Structure,” (with S. DeDeo and R.R. Caldwell), *Phys. Rev. D***67**, 103509 (2003).
48. “Rules for Computing Symmetry, Density and Stoichiometry in a Quasi-Unit-Cell Model of Quasicrystals,” (with H.-C. Jeong), *Phys. Rev. B***68**, 64102 (2003).
49. “Sensitivity of the cosmic microwave background anisotropy to initial conditions in quintessence cosmology,” (with R. Dave and R. Caldwell), *Phys. Rev. D***66** 023516 (2002).
50. “Measuring the Speed of Sound of Quintessence,” (with J. Erickson, R. Caldwell, V. Mukhanov and C. Armendariz-Picon), *Phys. Rev. Lett.* **88**, 121301 (2001).
51. “Is Vacuum Decay Significant in Ekpyrotic and Cyclic Models?,” (with N. Turok), *Phys. Rev. D***66** 101302 (2002).
52. “Measuring the Equation-of-state of the Universe: Pitfalls and Prospects,” (with I. Maor, R. Brustein, and J. McMahon) *Phys. Rev. D***65** 123003 (2002).
53. “Cosmic Evolution in a Cyclic Universe,” (with N. Turok), *Phys. Rev. D***65** 126003 (2002).
54. “A cyclic model of the universe,” (with N. Turok), *Science* **296**, 1436 (2002).
55. “Identifying and Indexing Icosahedral Quasicrystals from Powder Diffraction Patterns,” (with P. Lu, K. Deffeyes, and N. Yao), *Phys. Rev. Lett.* **87**, 275507 (2002).
56. “Density Perturbations in the Ekpyrotic Scenario,” (with J. Khoury, B. Ovrut and N. Turok), *Phys. Rev. D***66** 046005 (2002).
57. “From Big Crunch to Big Bang,” (with J. Khoury, B. Ovrut, N. Seiberg, and N. Turok), *Phys. Rev. D***65** 086007 (2002); hep-th/010818.
58. “Visible Branes with Negative Tension in Heterotic M-Theory,” (with R. Donagi, J. Khoury, B. Ovrut and N. Turok), *JHEP* **0111** 041 (2001).
59. “Comment on the Pyrotechnic Universe,” (with J. Khoury, B. Ovrut and N. Turok), hep-th/0105212.
60. “Q-ball candidates for self-interacting dark matter,” (with A. Kusenko), *Phys. Rev. Lett.* **87**, 141301 (2001).

61. “The Ekpyrotic Universe: Colliding Branes and the Origin of the Hot Big Bang,” (with J. Khoury, B. Ovrut and N. Turok), *Phys. Rev.* **D64** 123522 (2001).
62. Comment on “A Quasi-Unit Cell Model for d- $Al_{72}Ni_{20}Co_8$  based on Clusters with Broken 10-fold Symmetry,” (with E. Abe, K. Saitoh, H. H. Takakura, A.P. Tsai and H.-C. Jeong), *Phys. Rev. Lett.* **84**, 111, (2000).
63. “Limitations in using luminosity distance to determine the equation-of-state of the universe,” (with I. Maor and R. Brustein), *Phys. Rev. Lett.* **86**, 6-9, (2001).
64. “Essentials of  $k$ -essence,” (with C. Armendariz-Picon and V. Mukhanov), *Phys. Rev.* **D63**, 103510 (2001).
65. “Halo Properties in Cosmological Simulations of Self-interacting Cold Dark Matter,” (with R. Davé, D.N. Spergel, and B. Wandelt), *Ap. J.* **547**, 574-589 (2001).
66. “Inflationary solutions in the brane-world and their geometrical interpretation,” (with J. Khoury and D. Waldram), *Phys. Rev.* **D63**, 103505-(1-13) (2001).
67. “A Dynamical Solution to the Problem of a Small Cosmological Constant and Late-time Cosmic Acceleration,” (with C. Armendariz-Picon and V. Mukhanov), *Phys. Rev. Lett.* **85**, 4438-41 (2000).
68. “A Cosmological Mechanism for Stabilizing Moduli,” (with G. Huey, B.A. Ovrut and D. Waldram), *Phys.Lett.* **B476**(2000) 379-386, (2000).
69. “A Simple Method for Computing the Non-Linear Mass Correlation Function with Implications for Stable Clustering,” (with R. Caldwell, R. Juskiwicz, and F. Bouchet), *Ap. J.* **547**, L93-96 (2000).
70. “Observational evidence for self-interacting cold dark matter,” (with D.N. Spergel), *Phys. Rev. Lett.* **84**, 3760-3 (2000).
71. “A Quasi-Unit Cell Model for d- $Al_{72}Ni_{20}Co_8$  based on Clusters with Broken 10-fold Symmetry,” (with E. Abe, K. Saitoh, H. H. Takakura, A.P. Tsai and H.-C. Jeong), *Phys. Rev. Lett.* **84**, 4609 (2000); cond-mat/9907160.
72. “General considerations of the cosmological constant and the stabilization of moduli in the brane-world picture,” *Phys.Lett.* **B462**, 41-47 (1999).
73. “Improved quasi-unit cell model of  $AlNiCo$ ,” (with H.-C. Jeong, K. Saitoh, M. Tanaka, E. Abe, and A.P. Tsai), *Nature* **396**, 55-77 (1998).
74. “A tracker solution to the cold dark matter cosmic coincidence problem,” (with I. Zlatev), *Phys. Lett.* **B459**, 570-574 (1999).

75. "Cosmic Concordance and Quintessence," (with L. Wang, R. Caldwell, and J.P. Ostriker), *Ap.J.*, **530**, 17-35 (2000).
76. "Cosmological Tracking Solutions," (with L. Wang and I. Zlatev), *Phys. Rev. D***59**, 123504 (1999).
77. "The Cosmic Triangle: Revealing the State of the Universe," N. Bahcall, J.P. Ostriker, S. Perlmutter and P.J. Steinhardt, *Science* **284**, 1481-1488 (1999).
78. "Quintessence, Cosmic Coincidence, and the Cosmological Constant," (with I. Zlatev and L. Wang), *Phys. Rev. Lett.* **82**, 896-899 (1999).
79. "Experimental verification of the quasi-unit-cell model of quasicrystal structure," (with H.-C. Jeong, K. Saitoh, M. Tanaka, E. Abe, and A.P. Tsai), *Nature* **396**, 55-57 (1998).
80. "Resolving the Missing Energy Problem," (with G. Huey, L. Wang, R. Dave, and R. R. Caldwell), *Phys. Rev. D***59**, 063005, 6 pp. (1999).
81. "Cluster Abundance Constraints on Quintessence Models," (with L. Wang), *Ap. J.* **508**, 483-490 (1998).
82. "The Imprint of Gravitational Waves in Models Dominated by a Dynamical Cosmic Scalar Field," (with R.R. Caldwell) *Phys.Rev. D***57** 6057-6064 (1998).
83. "Density Perturbations in Multifield Inflationary Models," (with V.F. Mukhanov) *Phys. Lett. B***422** 52-60 (1998).
84. "Cosmological Imprint of an Energy Component with General Equation-of-State," (with R.R. Caldwell and R. Dave), *Phys. Rev. Lett.* **80**, 1582 (1998).
85. "Parametric Resonance in an Expanding Universe," (with I. Zlatev and G. Huey), *Phys. Rev. D***57** 2152-2157 (1998).
86. "On the Problem of Predicting Inflationary Perturbations," (with L. Wang and V.F. Mukhanov), *Phys. Lett. B***414**, 18-27 (1997).
87. "Constructing Penrose-like Tilings from a Single Proto-tile and the Implications for Quasicrystals," (with H.-C. Jeong) *Phys. Rev B***55**, 3520-3532 (1997).
88. "A simpler approach to Penrose tiling with implications for quasicrystal formation," (with H.-C. Jeong) *Nature* **382**, 433-5 (1996).
89. "Regarding the Deceleration and Missing Energy of the Universe," Scientific Correspondence to *Nature* **382**, 768-9 (1996).
90. "The observational case for a low-density Universe with a non-zero cosmological constant," (with J.P. Ostriker) Letters to *Nature* **377**, 600 (1995).

91. "Modular Cosmology," (with T. Banks, M. Berkooz, S. Shenker, and G. Moore), *Phys.Rev.D***52**, 3548-3562,(1995).
92. "The Cosmological Moduli Problem, Supersymmetry Breaking , and Stability in Postinflationary Cosmology," (with T. Banks and M. Berkooz), *Phys.Rev.D***52**, 705-716, (1995).
93. "High Frequency Oscillations of Newton's Constant Induced by Inflation," (with C. M. Will), *Phys. Rev. D***52**, 628-639 (1995).
94. "How Well Can Cosmological Parameters Be Estimated From Cosmic Microwave Background Observations," (with J.R. Bond and R.L. Davis), *Astro. Lett. & Comm.* **32**, 53-62 (1995).
95. "A Cluster Approach for Quasicrystals," (with H.-C. Jeong), *Phys. Rev. Lett.* **73**, 1943 (1994).
96. "Measuring Cosmological Parameters with Cosmic Microwave Background Experiments," (with R. Crittenden, J.R. Bond, R. Davis, and G. Efstathiou) *Phys. Rev. Lett.* **72**, 13-16 (1994).
97. "Ising-like Transition and Phason Unlocking in Icosahedral Quasicrystals," (with T. Dotera), *Phys. Rev. Lett.* **72**, 1670-3 (1994).
98. "Polarization of the Microwave Background due to Primordial Gravitational Waves," (with R. Crittenden and R. Davis) *Astrophys. J. Lett.* **417**, L13-18 (1993).
99. "Finite Temperature Elasticity Transition in Decagonal Quasicrystals," (with H.-C. Jeong) *Phys. Rev. B***48**, 9394-403 (1993).
100. "The Imprint of Gravitational Waves on the Cosmic Microwave Background," (with R. Crittenden, J.R. Bond, R.L. Davis, and G. Efstathiou) *Phys. Rev. Lett.* **71**, 324-7 (1993).
101. "Challenges for Superstring Cosmology," (with R. Brustein) *Phys. Lett. B***302**, 196-201 (1993).
102. "Recent Advances in Extended Inflationary Cosmology," *Class. and Quantum Grav.* **10**, S33-S48 (1993).
103. "Cosmic Microwave Background Probes Models of Inflation," (with R. Davis, H. Hodges, G. Smoot and M. Turner), *Phys. Rev. Lett.* **69** 1856-59 (1992).
104. "Graceful Exit in Extended Inflation and Implications for Density Perturbations," (with R. Crittenden) *Physics Letters B***293**, 32-36 (1992).
105. "New Constraints and Improvements on Oscillating Physics," (with R. Crittenden), *Astro. J.* **395**, 360-5 (1992).

106. "Cosmological Consequences of High Frequency Oscillations of Newton's Constant," (with F. S. Accetta), *Phys. Rev. Lett.* **67**, 298-301 (1991).
107. "Coherent Peculiar Velocities and Periodic Red Shifts," (with C. T. Hill and M. S. Turner), *Astro. J.*, L57-60 (1991).
108. "Can Oscillating Physics Explain an Apparently Periodic Universe?" (with C. T. Hill and M. S. Turner), *Phys. Lett. B***252**, 343-348 (1990).
109. "New Approaches to Inflationary Cosmology," (with F. S. Accetta), *General Relativity and Gravitation* **23**, 1-5 (1991).
110. "Hyperextended Inflation," (with F.S. Accetta), *Phys. Rev. Lett.* **63**, 2740-3 (1990).
111. "Inflation and the  $\Omega$ -Problem," *Nature* *345*, 41 (1990). (Article reviewed in *News and Views* in the same issue.)
112. "Matching Rules and Growth Rules for Pentagonal Quasicrystal Tilings," (with K. Ingersent) *Phys. Rev. Lett.* **64**, 2034-7 (1990).
113. "Prescription for Successful Extended Inflation," (with D. La and E. Bertschinger) *Phys. Lett. B* **231**, 231-4 (1989).
114. "Comment on a Paper by L. Pauling," (with P. Bancel, P. Heiney, and P. Horn), *PNAS* **86**, 8600-1 (1989).
115. "Bubble Nucleation for Flat Potentials," (with L. Jensen) *Nucl. Phys. B***317**, 693-705 (1989).
116. "Bubble Percolation in Extended Inflationary Models," (with D. La) *Phys. Lett.* **220**, 375-8 (1989).
117. "Reply to *Local Growth of Quasicrystals*," (with G. Onoda, D. DiVincenzo, and J. Socolar) *Phys. Rev. Lett.* **62**, 1210 (1989).
118. "Extended Inflationary Cosmology," (with D. La) *Phys. Rev. Lett.* **62**, 376-9 (1989).
119. "Comment on *Icosahedral Ordering in Lennard-Jones Liquid and Glass*," (with D. Nelson) *Phys. Rev. Lett.* **62**, 978 (1989).
120. "Equilibrium Faceting Shapes for Quasicrystals," (with K. Ingersent) *Phys. Rev. B***39**, 980-992 (1989).
121. "Growing Perfect Quasicrystals," (with G. Onoda, D. DiVincenzo, and J. Socolar) *Phys. Rev. Lett.* **60**, 2653-6 (1988).
122. "Quasicrystals with Dodecahedral Equilibrium Faceting," (with K. Ingersent) *Phys. Rev. Lett.* **60**, 2444 (1988).

123. "Icosahedral Solids: A New Phase of Matter?," *Science* **238**, 1242-1247 (1987). (Invited Article)
124. "Quasicrystallinity of Icosahedral  $Pd_{58.8}U_{20.6}Si_{20.6}$ ," (with D. D. Kofalt, I. A. Morrison, T. Egami, S. Preische and S. J. Poon) *Phys. Rev.* **B35**, 4489-4492 (1987).
125. "Distinguishing a Quasicrystal from an Icosahedral Glass via High Resolution Lattice Imaging," *Phys. Rev. Lett.* **57**, 2769(C) (1986).
126. "Phonons, Phasons and Dislocations in Quasicrystals," (with J. E. S. Socolar and T. C. Lubensky) *Phys. Rev.* **B34**, 3345-60 (1986).
127. "Distortion and Peak Broadening in Quasicrystal Diffraction Patterns," (with J. E. S. Socolar, T. C. Lubensky, P. A. Bancel, and P. A. Heiney) *Phys. Rev. Lett.* **57**, 1440-3 (1986).
128. "Quantum Corrections and Locally Supersymmetric Inflationary Models," (with P. R. Lindblom and B. A. Ovrut) *Phys. Lett.* **172**, 309-12 (1986).
129. "Quasicrystals I: Definition and Structure," (with D. Levine) *Phys. Rev.* **B34**, 596-616 (1986).
130. "Quasicrystals II: Unit Cell Configurations," (with J. Socolar) *Phys. Rev.* **B34**, 617-647 (1986).
131. "Quasicrystals with Arbitrary Orientational Symmetry," (with J. Socolar and D. Levine) *Phys. Rev.* **B32**, 5547-51 (1985).
132. "Elasticity and Dislocations in Pentagonal and Icosahedral Quasicrystals," (with D. Levine, T. Lubensky, S. Ostlund, S. Ramaswamy, and J. Toner) *Phys. Rev. Lett.* **54**: 1520-3 (1985).
133. "Quasicrystals: A New Class of Ordered Structures," (with D. Levine) *Phys. Rev. Lett.* **53**: 2477-80 (1984).
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